Appl. No. : 10/594,207
Filed : September 21, 2006

AMENDMENTS TO THE CLAIMS

Please cancel Claims 1-15, without prejudice.

Please add Claims 16-31 as follows.

1-15. (Cancelled)

16. (New) A tire deformation calculating method for calculating a deformation of a tire which is rotating on a road surface, the method comprising;

an acquiring step for acquiring measurement data of acceleration of the rotating tire for a duration corresponding to at least one round of tire rotation, the measurement data of acceleration acquired by an acceleration sensor that is attached to a predetermined portion of the tire;

a signal processing step for deriving time series data of acceleration due to tire deformation from the acquired measurement data of acceleration, by removing a background component of the acquired measurement data of acceleration; and

a deformation calculating step for subjecting the time series data of acceleration due to tire deformation to a time integration of second order so as to obtain displacement data, to thereby calculate the deformation at the predetermined portion of the tire.

17. (New) The tire deformation calculating method according to Claim 16, wherein the predetermined portion is a tread portion of the tire,

wherein in the acquiring step, the acceleration of the tread portion of the tire is acquired, and

wherein in the deformation calculating step, the deformation of the tread portion of the tire is calculated.

18. (New) The tire deformation calculating method according to Claim 17, wherein:

a circumference region of the tread portion of the tire is divided into a first region including a contact region in contact with the road surface, and a second region including other than the first region;

in the signal processing step, a first approximation curve represented on the first and second regions is calculated by approximating the measurement data of acceleration in the second region, and time series data of acceleration due to tire deformation in the

first and second regions is derived by subtracting the first approximation curve from a waveform of the acceleration acquired in the acquiring step.

19. (New) The tire deformation calculating method according to Claim 18, wherein the first approximation curve is obtained by approximating the measurement data of acceleration in the first region in addition to the second region with a plurality of nodes provided in the second region.

20. (New) The tire deformation calculating method according to Claim 18, wherein the first approximation curve is calculated by approximating the time series data of acceleration in the first and second region, with weighting coefficients applied to the time series data of acceleration in the first region and to the time series data of acceleration in the second region,

wherein weighting coefficients applied to the time series data of acceleration in the second region are greater than weighting coefficients applied to the time series data of acceleration in the first region.

21. (New) The tire deformation calculating method according to Claim 18, wherein the second region has an angle in a circumferential direction of at least 60 degree in absolute values, the angle defined relative to a center position of the contact region of the tire.

22. (New) The tire deformation calculating method according to Claim 18, wherein a circumference region of the tread portion of the tire is divided into a third region including a contact region in contact with the road surface, and a fourth region including other than the third region, and in the deformation calculating step, a second approximation curve represented on the first and second regions is calculated by approximating the displacement data in the fourth region, and the deformation of the tire is calculated by subtracting the second approximation curve from a waveform of the displacement data.

23. (New) The tire deformation calculating method according to Claim 22, wherein the second approximation curve is obtainer by approximating the displacement data in the third region in addition to the fourth region with a plurality of nodes provided in the fourth region.

24. (New) The tire deformation calculating method according to Claim 22, wherein the second approximation curve is calculated by approximating the displacement data in third and fourth regions by using a least squares method with weighting coefficients applied to the displacement data in the third region and to the displacement data in the fourth region,

wherein weighting coefficients applied to the displacement data in the fourth region are greater than weighting coefficients applied to the displacement data in the third region.

25. (New) The tire deformation calculating method according to Claim 16, wherein the measurement data of acceleration is at last one of acceleration data in a radial direction perpendicular to a circumferential direction of the tire, acceleration data in the circumferential direction of the tire, and acceleration data in a width direction of the tire.

26. (New) The tire deformation calculating method according to Claim 16, wherein the measurement data of acceleration includes acceleration data in a radial direction perpendicular to a circumferential direction of the tire, or includes, in addition to acceleration data in the radial direction, acceleration data in the circumferential direction of the tire, and

wherein in the signal processing step, an acceleration component of a centrifugal force of the tire while rotating, and an acceleration component of a gravitational force of the tire while rotating are removed as the background component of the acquired measurement data of acceleration.

27. (New) The tire deformation calculating method according to Claim 16, wherein the measurement data of acceleration includes the acceleration data in a radial direction perpendicular to a circumferential direction of the tire, or includes, in addition to the acceleration data in the radial direction, the acceleration data in the circumferential direction of the tire; and the deformation of the tire is the deformation at the tread portion of the tire in the radial and circumferential directions, or the deformation in the radial direction; and from the deformation, the contact length of the tire during rotation is calculated.

28. (New) The tire deformation calculating method according to Claim 27, wherein if the measurement data of acceleration is the acceleration data in the radial direction perpendicular to the circumferential direction of the tire, the contact length is calculated by determining two positions at which the time series data of acceleration due to tire deformation crosses an acceleration of 0, and by using the two positions as positions corresponding to a leading edge and a trailing edge of the contact region of the tire.

29. (New) The tire deformation calculating method according to Claim 28, wherein the time series data of acceleration due to tire deformation to be used for calculating the contact

length is obtained by subjecting the deformation calculated in the deformation calculating step to a differentiation of second order with respect to time.

30. (New) The tire deformation calculating method according to Claim 27, wherein the contact length is calculated by obtaining a deformation shape of the tire from the displacement data obtained in the deformation calculating step and by assuming positions at which the deformation shape crosses a line which is a predetermined distance away from a lowest point of the tire toward upward direction of the tire as a leading edge and a trailing edge of the contact region of the tire.

31. (New) A tire deformation calculating apparatus for calculating a deformation of a tire which is rotating on a road surface, the apparatus comprising:

an acquiring unit for acquiring measurement data of acceleration of the rotating tire for a duration corresponding to at least one round of tire rotation, the measurement data of acceleration acquired by an acceleration sensor that is attached to a predetermined portion of the tire;

a signal processing unit for deriving time series data of acceleration due to tire deformation from the acquired measurement data of acceleration, by removing a background component of the acquired measurement data of acceleration; and

a deformation calculating unit for subjecting the time series data of acceleration due to tire deformation to a time integration of second order so as to obtain displacement data, to thereby calculate the deformation at the predetermined portion of the tire.